Group of Governmental Experts of the High Contracting Parties to the Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have Indiscriminate Effects

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Examination of various dimensions of emerging technologies in the area of lethal autonomous weapons systems, in the context of the objectives and purposes of the Convention

Autonomy in Weapon Systems

Submitted by the United States of America

I. Introduction

1. The United States of America acknowledges both the challenges and opportunities presented by emerging technologies in the area of lethal autonomous weapons systems (LAWS). As an overall matter, we believe that the law of war (also called international humanitarian law) provides a robust and appropriate framework for the regulation of all weapons in relation to armed conflict.

2. This working paper seeks to contribute to the meetings of the Group of Governmental Experts (GGE) on Lethal Autonomous Weapons Systems (LAWS) in Geneva between November 13-17, 2017, by providing the views of the United States on: (i) the legal review of weapons with autonomous functions in acquisition or development; (ii) the potential of weapon systems with autonomous functions to improve the implementation of law of war principles in military operations; and (iii) legal accountability regarding weapons with autonomous functions.

II. Legal review of weapons with autonomous functions in acquisition or development

3. The United States of America views the review of the legality of weapons as a best practice for implementing customary and treaty law relating to weapons and their use in armed conflict. The United States of America is not a party to the 1977 Additional Protocol I to the 1949 Geneva Conventions and therefore is not bound by that instrument, but we note that Article 36 of that Protocol creates an obligation for its Parties with respect to the study, development, acquisition, or adoption of a "new" weapon, means, or method of warfare.

4. Under United States Department of Defense (DoD) policies, legal reviews are conducted as part of the broader acquisition processes. In particular, a DoD policy (DoD Directive 5000.01) requires that the acquisition and procurement of DoD weapons and weapon systems be consistent with all applicable domestic and international law, including the law of war. To implement this requirement, DoD Directive 5000.01 provides that "[a]n

attorney authorized to conduct such legal reviews in the Department shall conduct the legal review of the intended acquisition of weapons or weapons systems."

5. Legal advice on the intended acquisition of weapons ordinarily may be provided at different stages in the process of acquiring such weapons. For example, under DoD policy on the use of autonomy in weapon systems (DoD Directive 3000.09), legal review and advice are provided before formal development and again before fielding with regard to certain types of weapon systems that involve the use of autonomy.

6. For the United States Department of Defense, the legal review of the acquisition or procurement of a weapon generally focuses on whether the weapon is illegal *per se* — whether a treaty to which the United States is a party or customary international law has prohibited its use in all circumstances. The use of autonomy to aid in the operation of weapons is not illegal *per se*.

7. Law of war issues related to targeting generally are not determinative of the lawfulness of a weapon. A legal review of a weapon should consider whether the weapon is "inherently indiscriminate," *i.e.*, whether the weapon is capable, under any set of circumstances and in particular the intended concept of employment, of being used in accordance with the principles of distinction and proportionality. Nevertheless, most targeting issues (*e.g.*, whether a weapon would be used consistent with the requirement that attacks may only be directed against military objectives) are only capable of determination when presented with the facts of a particular military operation.

8. Weapons that use autonomy in target selection and engagement seem unique in the degree to which they would allow consideration of targeting issues during the weapon's development. For example, if it is possible to program how a weapon will function in a potential combat situation, it may be appropriate to consider the law of war implications of that programming. In particular, it may be appropriate for weapon designers and engineers to consider measures to reduce the likelihood that use of the weapon will cause civilian casualties.

9. Under DoD policy, autonomous and semi-autonomous weapons systems go through "rigorous hardware and software verification and validation (V&V) and realistic system developmental and operational test and evaluation (T&E)." Although rigorous testing and sound development of weapons are not required by the law of war as such, these good practices can support the implementation of law of war requirements. Rigorous and realistic testing standards and procedures can ensure that commanders and national security policy makers can have a reasonable expectation of the likely effects of employing the weapon in different operational contexts. In addition, such practices can help reduce the risk of unintended combat engagements, such as weapons malfunctions that could inadvertently cause harm to civilians.

III. Compliance with the law of war in using weapon systems with autonomous functions

10. The law of war rules on conducting attacks (*e.g.*, the rules relating to distinction and proportionality) impose obligations on States and other parties to a conflict, and it is for individual human beings, commensurate with their role within the State or party to the conflict, to ensure compliance with those obligations when employing any weapon or weapons system, including autonomous or semi-autonomous weapons systems. For example, DoD policy recognizes that "[p]ersons who authorize the use of, direct the use of, or operate autonomous and semi-autonomous weapon systems must," among other requirements, "do so … in accordance with the law of war."

11. It is not the case that the law of war requires that a weapon, even a semi-autonomous or autonomous weapon, make legal determinations. For example, the law of war does not require that a weapon determine whether its target is a military objective, but rather that the weapon be capable of being employed consistent with the principle of distinction. Similarly, the law of war does not require that a weapon make proportionality determinations, such as whether an attack is expected to result in incidental harm to

civilians or civilian objects that is excessive in relation to the concrete and direct military advantage expected to be gained.

12. The law of war does not require weapons to make legal determinations, even if the weapon (*e.g.*, through computers, software, and sensors) may be characterized as capable of taking some form of action or decision in a given moment in the absence of direction by a human being, such as whether to fire the weapon or to select and engage a target. Relatively rudimentary autonomous weapons, such as homing missiles, have been employed for many years, and there has never been a requirement that such weapons themselves determine that legal requirements are met.

13. Rather, it is persons who must comply with the law of war by employing weapons in a discriminate and proportionate manner. For example, even if the weapon autonomously selects and engages targets, its use would be precluded when the use of the weapon would be expected to result in incidental harm to civilians or civilian objects that is excessive in relation to the concrete and direct military advantage expected to be gained.

14. In addition, the obligation to take feasible precautions in order to reduce the risk of harm to civilians and other persons or objects protected from being made the object of attack must be considered when using weapon systems with advanced autonomous functions. For example, depending on the circumstances, it might be feasible to monitor the operation of the weapon system and to stop its operation in the event that it malfunctioned or the circumstances change. As another example, it might be appropriate to consider whether it is possible to program or build mechanisms into the weapon that would reduce the risk of civilian casualties while in no way decreasing the military advantages offered by the weapon. A best practice in this regard may be found in the requirements in DoD policy for the interface between people and machines for autonomous and semi-autonomous weapons to: (1) be readily understandable to trained operators; (2) provide traceable feedback on system status; and (3) provide clear procedures for trained operators to activate and deactivate system functions. These requirements to improve human-machine interfaces assist operators in making accurate judgments regarding the use of force.

15. The ability of weapons to make decisions or assessments of issues that would be considered under law of war can be viewed as an additional feature that improves the ability of human beings to implement legal requirements rather than as an effort to replace a human being's responsibility and judgment under the law.

IV. Potential for autonomy in weapon systems to improve the implementation of law of war principles in military operations

16. In many cases, the use of autonomy in weapon systems could enhance the way law of war principles are implemented in military operations.

17. For example, very basic applications of autonomy allow some munitions to self-deactivate or to self-destruct, which helps reduce the risk these weapons may pose to the civilian population after the munitions have served their military purpose.

18. More advanced applications of autonomy may facilitate greater precision in guidance of bombs and missiles against military objectives, reducing the likelihood of inadvertently striking civilians and civilian objects as compared to the use of unguided bombs and missiles to achieve the same desired result.

19. Similarly, autonomous functions allow defensive systems to select and engage incoming enemy projectiles, such as mortars, artillery shells, and rockets. These defensive systems can provide military commanders more time to decide on how to respond to the threat. For example, directing "counter-battery fire" against the origin of the enemy projectiles has been a common response to such attacks, and the additional time afforded by autonomous defensive systems could allow military commanders more time to consider and execute a more deliberate and precise response.

20. These applications of autonomy illustrate a fundamental feature of the law of war — the law of war often reflects the convergence of military and humanitarian interests.

21. Autonomy can be used in weapon systems to create more capabilities. Commanders can use additional capabilities to increase the efficiency of military operations — more precisely applying force and causing less unintended destruction. Improving efficiency is done for sound military reasons — to allow fewer resources to accomplish more military purposes. But the same capabilities that reduce wasteful or incorrect applications of military force, such as incidents of "friendly fire," can also reduce the risk of civilian casualties.

22. For example, militaries might develop weapons with advanced technologies, such as smart grenade launchers, to give their soldiers new advantages in countering the use of cover by enemy fighters to avoid small arms fire. By reducing the need for even greater applications of force such as artillery or air bombardments, these weapons have potentially long-term benefits by reducing the effects of larger explosive weapons in populated areas or the presence of explosive remnants of war.

23. These types of "smart" weapons might create additional options for commanders — allowing attacks to be conducted in circumstances where the use of "dumb" weapons would cause significant or excessive civilian casualties. This, however, should not be construed as necessarily requiring States to use "smart" weapons when available rather than "dumb" weapons.

24. It is expected that further developments in autonomous and semi-autonomous weapon systems will allow military forces to apply force more precisely and with less collateral damage than would be possible with existing systems.

V. Legal accountability and weapons with autonomous functions

25. Machines are not States or persons under the law. Questions of legal accountability are questions of how existing and well-established principles of State and individual responsibility apply to States and persons who use weapon systems with autonomous functions.

26. As a general principle, States are responsible for the acts of persons forming part of their armed forces. It follows that States are responsible for the uses of weapons with autonomous functions by persons forming part of their armed forces as well as other such acts that may be attributable to a State under the law of State responsibility. States, in ensuring accountability for such conduct, may use a variety of mechanisms, including investigations, individual criminal liability, civil liability, and international disciplinary measures.

27. As with all decisions to employ weapon systems, persons are responsible for their individual decisions to use weapons with autonomous functions. For example, persons who use weapons with autonomous functions to violate the prohibition on targeting the civilian population may be held responsible for such violations.

28. The responsibilities of any particular individual belonging to a State or a party to the conflict may depend on that person's role in the organization or military operations. As a general matter, the persons who are responsible for implementing a party to a conflict's obligation are those persons with the authority to make the necessary decisions and judgments required by that international obligation. For example, a party to a conflict has the obligation to take feasible precautions to reduce the risk to civilians, such as providing warnings before attacks. The determination of whether it is feasible to provide such a warning would be made by the relevant commander in charge of the attack.

29. As noted above, advanced applications of autonomy in weapon systems can allow for issues that would normally only be presented in the context of the use of the weapon system to be presented in the context of the development of the weapon system. Persons who engage in wrongdoing in the development and testing of a weapon could be held accountable, at least under principles and rules of accountability in domestic law.

30. Intentional wrongdoing involving weapons is clearly prohibited. In the absence of intentional wrongdoing, assessments of accountability may be more complex. Mere accidents or equipment malfunctions are not violations of the law of war, even if civilians are killed or injured as a result of those malfunctions. The standard of care or regard that is due in conducting military operations with regard to the protection of civilians is a complex question to which the law of war does not provide a simple answer. This standard must be assessed based on the general practice of States and common standards of the military profession in conducting operations.

31. A general principle of accountability, which is reflected in the law of war, is that decision-makers must be judged based on the information available to them at the time and not on the basis of information that subsequently comes to light. Thus, for example, in assessing whether a commander's decision to use weapons with autonomous functions was reasonable in a particular context, whether the commander acted in good faith based on the information available to him or her at the time would need to be considered. In this regard, training on the weapon system and rigorous testing of the weapon system can help commanders be advised of the likely effects of employing the weapon system. These measures, found in DoD policy, can help promote good decision-making and accountability.